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TECHNOLOGY DIVISION

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DEADLY GERMS HARMLESS IF NOT IN RIGHT PLACE

Germs of diseases that are deadly to an animal or a human being if they find their way into the part of the body they usually afflict, may be entirely harmless if they are planted in another organ or tissue. Doses of anthrax germs a thousand times larger than an ordinary fatal injection have been introduced into the bodies of guinea pigs with no more effect than so much salt water; yet if the slightest trace of the fluid containing them found its way into a scratch on the skin, the animal very quickly died.

These experiments, which promise revolutionary results in the sciences of bacteriology and pathology, are being conducted at the Pasteur Institute in Paris by Dr. A. Besredka, a young Russian scientist, according to Dr. Erwin F. Smith, pathologist of the U.S. Department of Agriculture, who has just returned from a tour of inspection through European laboratories.

Dr. Besredka, he says, has discovered an entirely new principle in bacteriolo which has been named "local immunity". According to this principle, disease-causi organisms are frequently quite impotent to do harm away from their usual habital Anthrax, for example, is always an affliction of the skin and surface tissues, Dr. Besredka devised means for planting cultures of the germs deep in the muscular tissue, in the lungs and elsewhere in the bodies of guinea pigs. Aside from a little inflammation, probably due to the mechanical irritation of the instruments used, the animals showed no signs of harm from the usually deadly organisms. Less serio skininfections , like those caused by staphylococcus, the germ of boils, were shown to act in the same way.

Dr. Besredka's discoveries have already become of practical importance in medicine. After showing that susceptibility to bacterial infection was local, the Russian scientist also showed that immunity could be conferred more effectively by serums and other preventive means if applied equally directly to the regions usually attacked by the disease. Since typhoid fever is a disease of the digestive tract, Paris physicians are now following Dr. Besredka's principle, and administering anti-typhoid serum through the mouth rather than be means of injection int the arm. Dr. Besredka claims that when administered in the ordinary way the serum gets no chance to act until the blood has carried it from the muscles of the arm into the intestinal tract.

FINDS THAT GIRL BABIES "TAKE NOTICE" SOONER

Girl babies roll their eyes and look at bright lights sooner than boy babies do, Dr. M. J. Gutmann, a German psychologist, learned as a result of extended observations and tests on new born infants. Some babies, he found, shied at light, some were indifferent and others hailed it joyfully almost at birth. The latter were more often girls.

Dr. Gutman observed that reaction of the eyes to light occurred sooner in most cases than has hitherto been believed to be the rule. Some infants of only two or three days used their muscles in a properly coordinated fashion and gazed fixedly at bright objects such as lights. Babies as a rule must learn the use of the eye muscles by experience just as later they learn the use of the other muscles of the body.

PROVES REPTILES HAVE SENSE OF HEARING

"Deaf as an adder" is an old English catchword; but a German biologist, Prof. Karl Berger, has proved that at least some reptiles can hear. He experimented on two species of lizards, eight kinds of tortoises and a crocodile. The tortoises never gave any sign that they heard his signals, but the lizards and the crododiles responded. A sleeping lizard would open at least one eye when an electric bell was sounded. Changes in the rate of breathing also indicated the perception of sound, and this was used to measure the limits of pitch audible to reptilian ears.

Lizards could be trained to respond to sounds. Each day, while they were being fed, a certain note was sounded on a pipe. After two months the sleeping animals would awake and go at once to the customary feeding-place when they heard the familiar tone, showing that they had become used to the idea of music with their meals, and indeed that to them music meant meals.

SPENDS THREE YEARS STUDYING SAND GRAINS

Even a sand grain must travel to become well-rounded and acquire a polish. It must travel extensively, too - for most sand grains a journey from the center of the continent to the ocean, twice repeated, is necessary. Voyages by water smooth off the grains more rapidly than air travel, and even when traveling by wind, they rub each other only when they are rolling along the ground.

These are among the results of a three-year's study of sand grains conducted by Prof. Gustavus E. Anderson of the University of Oklahoma. The immediate objective of his research was to gain some light on the origin of sandstone deposits. Especially the oil-bearing sandstones. It is often of great importance, Prof. Anderson stated, for the oil prospector to know whether a given sandstone formation was laid down as wind-blown or as waterborne sand, and up to the present practically no laboratory investigations have been conducted to check up on the numerous extant theories.

Prof. Anderson simulated field condition by tumbling sand samples of various types in bottles on rotating drums, some of the bottles containing sand inwater, other sand without water. By keeping them constantly on the move he was able to get in a few hundred hours the same effects that in nature require many hundreds of years

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INDIANS AND EARLY CHINESE HAD SIMILAR LANGUAGES

New light was thrown on the ancestry of the American Indian today by Dr. Edward Sapir, noted Canadian anthropologist, now on the faculty of the University of Chicago. Dr. Sapir said that his research work on Indian linguistics has convinced him of the identity of the language of certain Indian tribes with that of the primitive Chinese.

The similarity of the two tongues and the linguistic distribution of tribes scattered at random over the Americas have convinced Dr. Sapir that these groups must have entered this continent as a wedge from Asia. By a close comparison of the primitive Chinese, Siamese, and Tibetian, all in the same language category, with the language of the "Nadine group" of North America, Dr. Sapir has found the same peculiarities of phonetics, vocabulary, and grammatical structure on both sides of the Pacific ocean.

The American Indian groups speaking the language of the Nadine group, are found in all parts of the North American continent from northern Mexico to the southern boundary of Alaska, widely distributed among other Indian tribes whose language and customs are entirely different.

With minor changes, he asserted, the Navago of New Mexico speaks the languages of the Sarcee in Alberta, and the linguistic stock of the Tlingit, just south of the Eskimos in Alaska, is much the same as that of the Hupa in California.

It is probable, according to Dr. Sapir, that the migration of Asiatics speaking primitive Chinese or Tibetian took place sometime in the past, and that these immigrants settled or moved over the mountains and plains, some remaining in north western Canada to become the Tlingits, and others moving out to the Queen Charlotte Islands off the west coast to form the Haida group, and still others penetrating to the deserts of the Southwest.

From the modern Chinese, which in academic circles is considered relatively simple, students of linguistics can reconstruct primitive Chinese which is vastly more complex than any of the dialects known to the Mongolian layman of today. Dr. Sapir has discovered not only that the Indians of the Nadine groups speak with a tonal accent, raising or lowering of the voice to give certain meaning to words, in a manner similar to the tonal peculiarities of the early Chinese, but also that the meanings of certain words are identical. Further, he has disclosed the fact that the Indians have retained certain prefixes and suffixes that long ago have disappeared from the Chinese speech, but which are clearly discernable in the early forms.

A flat fish on first hatching is symmetrical and swims with its edges vertical; but before the little fish is very old one of its eyes gets the wanderlust and migrates around to the other side of the head; the fish sinks to the bottom where it spends the rest of its life flat on its side, eyes up.

British commercial aviation companies state that their machines flew 778,000 miles in 1922 and over one million miles in 1924, carrying 15,000 passengers with only one fatal accident.

NEW THEATER LIGHTING TO MAKE "MOVIES" MORE NATURAL

Improvement of the "movies" by more scientific lighting of the theaters, was recently urged before the Royal Photographic Society by Dr. K.C.D. Hickman, of the Department of Chemistry at the Royal College of Science of England. This does not require more lights, but a better arrangement of the illumination, he says. Chief of his recommendations, which are based on a study of the operation of the human eye, is that instead of surrounding the screen with black velvet or other dark hangings, this area should be fairly bright. The screen itself, however, should not receive any light, other than that from the projector.

The chief trouble with the lightning in the theaters is in contrast. "Only a small portion of the retina - the sensitive lining of the eye- is being used," Dr. Hickman states, "while the outer portion is being kept dark; whereas anywhere else it would all be subject to the same illumination. It is the field of view embraced by this outer region which determines the sensitiveness of the eye. This increases the contrast and apparent brightness, giving the picture a fictitious strength and brilliancy, and also it induces eye-strain. A collateral effect is the destruction of all sense of blackness, for it is impossible to appreciate as black the shadows in scenes whose darkest parts are brighter than the surroundings in the theater."

The improvements suggested by Dr. Hickman consist in arranging the side lights so that they cannot shine on the screen. The region around the screen might be illuminated, he says, by making it of light color and projecting light on to it from an extra stereopticon in the booth, using a slide with a central opaque portion, so that none of it would go on the screen. Another method suggested would be to have the screen a short distance from the wall, with lights back of it. In this way, he asserts, the lighting of the theater would be more uniform, and the effect would be more that of an actual scene viewed through a window.

KITCHEN SOAP KILLS GERMS

Soap has a value as an aid to health even greater and more direct than has hitherto been suspected. The ordinary routine of dishwashing and laundering or cleaning the face and hands is fatal to germs of such dangerous diseases as pneumonia, diphtheria, blood poisoning and other serious infections. Dr. John E. Walker of the Service Laboratory of the Army and Navy General Hospital at Hot Springs, Arkansas, has just concluded extensive experiments which showed that common soaps were effective germicides in at least three types of infections, while soap made with coconut oil was markedly destructive to the organisms of typhoid fever.

The soap in greatest use around hospitals is the "official soft soap". The substitution of coconut oil for the linseed oil used in making this soap, Dr. Walker said, would render it germicidal against the typhoid bacillus as well as against the other three organisms. Although this change would make the soap more irritating to the skin, the change would be desirable, and it would be useful in case of typhoid epidemics.

All the soaps tested were more antiseptic at higher temperature. The organism causing boils, known technically as Staphylococcus aureus, completely resisted all soaps, even at a higher temperature, except a sodium resin soap.

Dr. Walker found that when the hands were washed with ordinary care the lather formed contained about eight per cent. of soap. This amount he said was more than enough to kill the pneumonia, diphtheria, and streptococcus bacilli. The most careful washing of hands, however, did not kill the staphylococcus or boil-forming organisms, which showddthat soaps alone could not be relied upon for complete surgical sterility.

In spite of claims put forth by manufacturers of special soaps, they were found to be no more effective than the average household kind. Foreign substances mixed with the soap often interfered markedly with the germicidal action.

COD LIVER OIL FREED OF BAD TASTE

Drs. Harry E. Dubin and Casimir Funk, New York biochemists, have at last succeeded in taking the bad taste of cod liver oil out of the mouth of babes. Until the discovery of vitamins a decade or so ago, no one but grandmother knew why cod liver oil was so good for childish ailments, and she just knew. When it was found that this vile-tasting oil was the richest known source of two vitamins, one preventing rickets in children and the other warding off a serious eye disease that results in blindness, efforts have been made to develop an extract of it that would be easy to take.

The success of Drs. Dubin and Funk not only does this, but also provides a convenient starting point for the actual chemical isolation and identification of vitamins, because it furnishes a purer material several thousand times as strong in vitamin content as the original oil. Laboratory tests on animals and clinical tests on a large number of children, by Drs. Louis Fisher, director of the Infantorium and Nursery of the Hecksher Foundations of New York have shown that both the antirachitic and antiophthalmic vitamins are retained in the extract.

The problem of making vitamin extracts or of preserving vitamins under artificial conditions has always been a difficult one, because those unknown substances are very easily destroyed. Even the simple cooking of many foods destroys a large part of the vitamin content. The success of Drs. Dubin and Funk was the result of several years' work.

They first made an acid extract of cod liver oil using either acetic acid, the essence of vinegar, or formic acid, an acid found in ants. In this way they obtained from 2,000 grams, or nearly two pounds, of cod liver oil, 50 grams of a substance that retained all the vitamins, and left the bulk of the oil behind, as well as almost all of the taste.

The extract portion was made into a kind of soap, with caustic potash, just as animal fats were once made into soap with lye leached from wood ashes. From this saponified portion, one half of a gram of a crude active concentrate was obtained. It was a brown sirupy mass which crystallized into light yellowish brown needle-like crystals radiating from a central point. An organic substance, cholesterol, which occurs in animal tissue was eliminated, and the final potent extract from the 2,000 grams of cod liver oil weighed only one tenth of a gram.

The chemical composition of this substance has not yet been established; the experimenters found that it contains carbon, hydrogen and oxygen, and that sodium, sulphur, phosphorus and chlorine, elements frquently occurring in organic substances, are absent.

BRIDGE ACROSS ATLANTIC DISCOVERED BY GEOLOGISTS

America and Scotland were formerly joined by a bridge of land, according to evidence discovered by a geological expedition under the leadership of Drs. E. O. Ulrich and C. E. Resser of the U.S. National Museum and Prof. R. M. Field of Princeton University, who have just returned to this country with several hundred pounds of selected fossils.

Fossils of trilobites, extinct crab-like animals, found in limestone at Durness, Scotland, were discovered to be exactly similar to those from northeast Newfoundland and entirely different from those found in Southeast Newfoundland, Wales, Central England, Southern Scandanavia, and Central Europe. Comparison of these ancient marine animal remains on both sides of the Atlantic indicates that some sort of land barrier prevented the mixing of animals from the Arctic sea on the North and the Atlantic on the south. This isthmus was evidently narrow, the Arctic and Atlantic animals being found in rocks within one hundred miles of each other at both the American and European ends.

Work has been started on the more detailed study of the fossils in order to determine more accurately the distribution of land and sea during the Cambrian and Silurian epochs of geological time, when the trilobites and corals unlike those found today flourished abundantly.

In collecting the specimens, the expedition visited England, Wales Scotland, Norway, Sweden, Denmark, Germany, and Czechoslovakia, and held frequent conferences with leading European geologists in an endeavor to correlate the rock strata if America with similar outcrops in Europe.

ANCIENT VIKING STRONGHOLD DISCOVERED IN SWEDEN

A powerful Viking fortress, the headquarters of a northern chieftain of at least 1300 years ago, was uncovered and identified near the city of Norrkoeping recently by two Swedish archeologists, Dr. Arthur Norden and Colonel N. D. Edlund. Since the name of the place, [illegible]d "Ringstad" is identical with one mentioned in the Icelandic Edda, or collection of historic legends, as the estate of the heroic Helge Hundingsbane, this may have been the seat of one of the mightiest of Vikings. The location at the head of the Bravalla Bay is of obvious strategic importance, and remains of primitive fortifications, or palisades, have been traced in several directions.

What was first unearthed was the stone foundations ofan ancient dwelling with several adjuncts, characteristic of the Viking Age. As the structures themselves had been built of wood hardly anything but charcoal remained of them, but on the site of what had formerly been the blacksmith shop, where horses were shod and swords forged, there was found in a good state of preservation a bronze clasp that had evidently been brought to the shop for repairs and had then been lost. An adhering bit of rust indicated that attempts had been made to mend the broken pin with iron. This clasp was easily identified as belonging to the seventh century A.D. , but a spear point found on the site of the women's building dated from the third of fourth century, while other objects classified themselves as late as the fourteenth, so that the place had apparently been occupied as a human dwelling for a thousand years. In the course of time it had either been burnt to the ground and had then been forgotten, or the occupants had moved to a stone fortress, Ringstaholm, about three miles

farther south.

The stone foundations extend about 150 yards in one direction and sixty in the other. Besides the "Women's House" and the blacksmith shop, there are traces of a banquet hallwith benches attached to the long side walls, as described in the sagas, and down by the river banks signs of a slaughter house, where barbecues were prepared at Yule tide and when thewarriors returned from their raids. Of the wooden spiles used in fortifications the best preserved remnants were uncovered by the drainage of the river.

AQUICULTURE NEXT?

By Dr. Frank Thone ,
Science Service Staff Writer

Effotts of the agricultural system of any given country or civilization to meet the pressure caused by increasing population can be classified under three general heads. First, acreage is increased, and even the less productive lands are brought under the plow. Second, more intensive methods of cultivation are brought into use, and finally, new methods and new crops are sought, for adaptation to areas not workable by methods in present use.

All three of these means are being employed in the United States. Every year we hear of great increases in the number of acres under cultivation, with additions especially from drained swamp and lake bottoms, reclaimed arid regions in the West, and opening up of cut-over timber land. Intensive agriculture is constantly being preached as the only possible means for making the high-priced land of the corn and cotton belts continue to pay. And the Department of Agriculture keeps a corps of botanical explorers busy combing the whole earth for things that will make farming more profitable in the less favored parts of the country, Notable among the trophies of such huntings are new forage crops for dry lands, and new root vegetables for regions where potatoes will not grow.

Anentirely different "lead",which is only just beginning to attract attention, is the idea of utilizing shallow waters whose drainage is not possible or profitable . So far, thereis little more to boast of than a series of tentative and rather miscellaneous beginnings and suggestions, but there are enough of these to show very distinct possibilities in this new business of "aquiculture"- as someone, in recognition of its aquatic nature, has proposed to name it.

Fish farming, of course, is the oldest branch of aquiculture, and the only one really widely practised. It started with the miscellaneous dumping of fish eggs and fry into almost any kind of pond or river, but now fisheries men want to know about the plants that grow under water in any proposed planting place, for though few fish feed directly on plants, the snails and worms and other water "bugs" that fish eat are vegetarians. Fish farming, as well as two otherestablished but less widely practised branches of aquiculture- alligator farming and wild-fowl farming-serve to indicate pretty well what the probable first developments in this field will be. It will be noticed that they are more like old-style cattle ranching than like farming proper: there is no direct harvesting of the water plants,but suitable pastures are selected and the animals allowed to range, being hunted or rounded up when they are needed.

So far, only the mixed natural pastyre has been used-the industry is still in its most primitive state. But men with constructive imaginations have already been looking out for plants that might be adaptable to more intensive methods, and one or two, at least, seem promising.

MOUNTAIN ASTRONOMERS STUDY SUN'S MOTION

By James Stokley,
Science Service Staff Writer.

In recent years there has been a tendency to build great observatories on mountains. One of the first and probably the best example of such an institution is the Lick Observatory of the University of California, situated on Mt. Hamilton, 4209 feet above sea level, near San Jose. Unlike the Mt. Wilson Observatory, near Pasadena, from which "Old Baldy" and other peaks may be seen towering higher in the distance, the Mt. Hamilton observatory is on the highest peak for many miles, and from it may be seen, when the air is clear, the Sierra Nevadas, nearly 200 miles distant.

The Lick Observatory was founded by James Lick, a San Francisco millionaire, who died in 1876, and in 1888 scientific work was begun. Lick founded it as a personal memorial, and it is truly such, for under the cast iron pier of the great 36-inch refracting telescope, in the masonry base, are deposited his mortal remains; and on the side a simple bronze tablet proclaims, "Here lies James Lick". When built this telescope was the largest of its kind in the world, and even today it is exceeded in size only by one other, the 40-inch at the Yerkes Observatory of the University of Chicago. However, it is probable that the superiority of the climate at the Lick Observatory over that of Wisconsin more than compensates for the difference in the size of the lens.

Since the completion of the observatory many famous astronomers have used the great telescope, and the excellence of its manufacture is evidenced by the fact that since then it has required no important repairs, and is still apparently in as good condition as when constructed. One of the chief researches that it has been used for recently has been to make spectrum photographs for the preparation of a catalog of radial velocities of stars down to the fifth magnitude, the limit of naked eye visibility. This catalog, when published, within a year or so, will tell the astronomer just how fast these stars are moving away from, or approaching the earth. It was begun, and much of the work on it since was done by the director of the observatory, Dr. W. W. Campbell. For the last two years, however, Dr. Campbell has been president of the University of California, and has been unable to give full time to its completion. Dr. J. H. Moore, astronomer at the observatory, is now giving most of his time to the work. Since the catalog will include stars not visible in the northern hemisphere, a large number of the spectrum photographs have been made by the southern branch of the observatory, located near Santiago, Chile. Some of the photographs have been made with the 36-inch reflecting telescope at Mt. Hamilton.

The method consists in measuring the displacement of the dark lines which appear in the star's spectrum formed after its light has been passed through a narrow slit and the proper combination of prisms and lenses. From the amount and direction of this displacement, the astronomer can determine the radial velocity of the star very accurately, within less than a mile a second. But the measures of

the radial velocities of these stars, 2600 in all, has been but a means to an end, to find out how fast, and in what direction the sun, with the earth and the rest of the solar system, is moving through space. For many years it has been known that the sun is moving toward a point near the bright star Vega, in the constellation of Lyra. At first, it might seem hard to see the relationship between the promiscuous motions of the stars and the path of the sun, but it is not so difficult as it seems. If the stars are moving in all possible directions and we measure their velocities, there should be just as many moving one way as another in all parts of the sky, provided the earth is standing still. But if the sun, and the earth with it, is itself moving rapidly in a certain direction, most of the stars in the direction we are going will seem to be approaching, while the greater number of stars in the direction from which we come will seem to be receding. In this way, Dr. Moore has found that the sun is moving through space with the speed of about 12 miles per second.

Nor has this been the only application of the measures of the stellar spectra, as over a thousand spectroscopic binary stars, or "doubles" have been found from the plates. These are pairs of stars that revolve around each other, but are so close that even the highest powers of the telescope do not reveal their duplicity. The spectroscope does, however, for when one member of the pair is moving from us, the lines are displaced in one direction. At the same time the other member is moving towards us, and it displaces the lines in the other direction, the result being that the lines appear as double, when the line joining the stars is at tight angles to a line to the earth. When the two stars are in line with us, the spectrum lines appear single, and from the alternation of single and double lines the time the stars require to revolve around each other may be determined.

However, not all binary stars are spectroscopic - some are far enough apart to be seen as double with the telescope, and it is these that Dr. R. G. Aitken, associate director, who is in charge of the observatory in the absence of Dr. Campbell, is studying and measuring with the 36-inch telescope.

S. W. Burnham, at one time with the Lick Observatory, and later at the Yerkes Observatory, was one of the first to catalog these stellar twins, and upon his death, his papers and books were turned over to the late Dr. Eric Doolittle, of the University of Pennsylvania, as the leading authority then on the subject. When Pr. Doolittle died, Burnham's results, as well as his own, were given to Dr. Aitken, who is now engaged in an extension to Burnham's catalog, which will be published by the observatory within a year. The importance of these doubles is shown by the fact that one star out of 18 in the sky can be seen as double with the 36 inch telescope. Altogether this observatory has been responsible for the discovery of nearly 5,000 of them.

CENTRAL AMERICAN EARTHQUAKE TRACED TO HONDURAS MOUNTAINS

The earthquake which shook Nicaragua and other parts of Central America on Sunday night, October 4, has been traced to south-eastern Honduras, according to Commander N. H. Heck, in charge of the earthquake investigations of the U.S. Coast and Geodetic Survey. In a statement today, Commander Heck said, "The epicenter, or point of maximum disturbance, was at 14 degrees 30 minutes north latitude and 85 degrees 30 minutes west longitude, which places it in the Colon Mountains near the Nicaragua-Honduras boundary. The quake occurred at 11 hours 9 minutes and 2 seconds P.M. eastern Standard time. We have arrived at this result by means of re-

reports obtained by Science Service from seismographic stations at the Dominion Observatory, Ottawa, Canada; Fordham University, New York; the U.S. Weather Bureau at the University of Chicago; and the Coast and Geodetic Survey's stations at Tucson, Ariz. and Cheltenham, Md. A peculiar feature of the quake was that it was apparently most severe in Managua, Nicaragua, nearly 200 miles from the epicenter, while Tegucigalpa, the capital of Honduras, about a hundred miles distant, seems to have escaped unscathed."

TABLOID BOOK REVIEW

The New England-Acadian Shoreline, by Douglas Johnson, 628 pp., New York, John Wiley & Sons, 1925. $8.50

From the time that the Pilgrims landed on Plymouth Rock to the present, the North Atlantic seaboard has been the subject of much song and story as well as scientific discussion, but in this book, Prof. Johnson treats these shores from a viewpoint not so common, that of the physiographer. In doing so he has produced an exhaustive work which should be invaluable to the student of geography or geology, but the book will undoubtedly be of interest to a much wider range of readers. The marine biologist, the engineer, and even the lawyer interested in the complications attending coastal property will find that their fields are not neglected. In addition, the mechanical details are excellent and the numerous photographic illustrations are well selected and reproduced, making it a book to be recommended in every way.

Useful Aspects of Geology, by S. J. Shand, 197 pp; New York, D. Van Nostrand Co., 1925. $2.50

The purpose of this book is best explained in the words of the author, who says that it is "offered to the large class of people who have never picked up any systematic knowledge of geology, and who are interested, whether as landowners, shareholders, prospectors, engineers, builders, miners, farmers, or perhaps just as lookerson, in one of the many undertakings that depend for their success on the applications of geology.....I thought that I could help them if I gave, in quite small bulk, an account of the various ways in which a knowledge of geology can be turned to use, and showed them where to go for fuller information on each particular matter."

In this endeavor, he has ably succeeded, and has produced a book which, while not free from technical terms, does not introduce them without adequate explanation, and to understand it does not require more than a very elementary knowledge of chemistry on the part of the reader.

China imported nearly seven billions of cigarettes from the United States in the fiscal year just ended, thereby taking 72 per cent. of the total exports.